Message

From: Kappelman, David [Kappelman.David@epa.gov]
Sent: 2/18/2021 4:00:51 PM
To: Hays, David C Jr CIV USARMY CENWK (USA) [David.C.Hays@usace.army.mil]; Praskins, Wayne [Praskins.Wayne@epa.gov]
Subject: RE: HPNS RGs and MDCs

As stated in the "answer" from HPS. This method and "limits" are not widely accepted or endorsed and it does not account for any other natural decay chain or other alpha or beta emitting radionuclides that may have more conservative "limits" that may or may not be included in the "background".

Dave

From: Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>
Sent: Thursday, February 18, 2021 9:10 AM
To: Praskins, Wayne <Praskins.Wayne@epa.gov>
Cc: Kappelman, David <Kappelman.David@epa.gov>
Subject: RE: HPNS RGs and MDCs

Wayne, below is an excerpt from a USACE guidance document that provides the following example from the Health Physics Society regarding the Th-232 chain and an ANSI release standard. Shows how gross alpha and beta counting should take into account the decay chains. Note that here the specific Th-232 limit is 60 dpm/100cm2 (as explained in the ANSI std 600 total Th chain/10 chain members = 60 for each member). Thus if chain is in equilibrium and using a gross emissions count then 60x6 aphas = gross alpha limit of 360 and 60x4 betas = 240 gross beta limit.
----------excerpt----------
"The following is an excerpt from and based on the Health Physics Society answer to a question posted to "Ask the Experts" in June 2017 regarding the expert's opinion or interpretation of applying American National Standards Institute (ANSI)/Health Physics Society (HPS) standard N13.12 to gross alpha/gross beta surveys for release.

Question:

I'm hoping to get an expert's opinion or interpretation of applying American National Standards Institute (ANSI)/Health Physics Society (HPS) standard N13.12 to gross alpha/gross beta surveys for release.

The way I read it is that using, say, thorium-232 (Th-232) and progeny as a Group 1 radionuclide, one would take the 600 disintegrations per minute (dpm) per 100 square centimeters (cm2) limit and break it out into alpha and beta components. Given 10 decays (4 beta and 6 alpha), one would have a gross alpha release limit of 360 dpm alpha per 100 cm2 and 240 dpm beta per 100 cm2 (or 180 dpm beta per 100 cm2, assuming the energy of the radium-228 (Ra-228) beta is too low to measure).

I've heard differing thoughts on ANSI/HPS N13.12, including that the 600 dpm per 100 cm2 applies to each daughter individually. I would be interested in hearing an expert's opinion.

Answer:

The following answer is based on the current version of the standard, ANSI/HPS N13.12-2013 (approved in 2013). Footnote d in Table 1 of the standard states that "the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present." I presume your question refers to Th-232 plus all progeny in equilibrium. In that case, you are correct that the screening level (in the example, 600 dpm per 100 cm2) applies effectively to the 10 radionuclides in the decay chain. And, as you indicated, there are effectively six alpha emitters and four beta emitters; I say "effectively" because there are more radionuclides, but polonium-212 (Po-212) and thallium-

208 (Tl-208) would be present at lower relative concentrations due to the branching at bismuth-212 (Bi-212). Thus, it is appropriate to consider two limits, one for gross alpha and one for gross beta, based on their relative contributions to the total activity screening level.

So, for the example given, it would be appropriate to use a gross alpha limit of (600 dpm per 100 cm2) × 0.6 = 360 dpm per 100 cm2, and similarly a gross beta limit of (600 dpm per 100 cm2) × 0.4 = 240 dpm per 100 cm2. You also proposed making the beta limit 180 dpm per 100 cm2 to account for the instrument's inability to detect the low-energy betas of Ra-228. This could be done, but it should be clearly described that this is not truly a gross beta limit, as some betas are not being measured or reported. Alternatively, in making surveys to meet these limits, the instrument and surface efficiencies for each of the radionuclides should be considered (which in some cases, like for the Ra-228 betas, may be an efficiency of zero) in determining an overall efficiency. However, since the use of the ANSI/HPS N13.12 standard has not been endorsed by all regulators in the United States (e.g., the NRC staff has not generally endorsed it at this time), I recommend that you consult with the appropriate regulatory authority to obtain approval for your specific case."

From: Praskins, Wayne <Praskins.Wayne@epa.gov>
Sent: Tuesday, February 16, 2021 12:42 PM
To: Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>
Cc: Kappelman, David <Kappelman.David@epa.gov>
Subject: [Non-DoD Source] RE: HPNS RGs and MDCs

Dave –

Thanks! Two follow ups:

1. You mention (and we have discussed) setting a gross alpha limit based on contaminants, isotopic ratios, and equilibrium assumptions. Do you know of any examples where that's been done?
2. You mention that you have used a counting instrument's critical level to decide which wipes to send to a lab or count longer. If you do that, how would you pick the targeted critical level? Would you set it at your BPRG/release limit (accepting a MDA above the BPRG/release limit for some or most samples)?

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From: Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>
Sent: Friday, February 12, 2021 5:33 AM
To: Praskins, Wayne <Praskins.Wayne@epa.gov>; Kappelman, David <Kappelman.David@epa.gov>
Subject: RE: HPNS RGs and MDCs

Wayne, Good morning. The counting statistics they are referencing are correct. What they are presenting is somewhat simplistic by keeping sample and background count times the same which CDPH did not. As such they did not provide a direct apples to apples comparison to CDPH approach. The cited reference document has equations for differing background and sample count times as well. With that said, I agree a 1.2 dpm/100 cm2 limit is very difficult and would require longer count times at best. Where I see flaws in their logic is that the 1.2 BPRG is specific to Ra-226 and not a gross alpha limit. A gross alpha limit based on contaminants, isotopic ratios, and equilibrium assumptions would be higher given the site specifics. It may still require longer than 1 min count times typically used in the field.

They also should consider changing their approach to counting and to the number of wipe samples required. Other instruments could be used for gross alpha counting (reducing count times) as well as sending them to a lab. I recommend reducing the total number of wipe samples required to account for any increased count times. This can be done given consideration of the purpose of wipe sampling. As an example: we typically will just use wipe samples to

verify assumptions in our risk models are appropriate. We rely on our fixed instrument readings to identify contamination and then only wipe sample the areas of known contamination. This greatly reduces the total number of wipes to count. As a conservative measure we wipe sample 10% of fixed reading locations regardless of instrument readings. Additionally, use of the fixed instrument critical level can be used as an investigation level requiring a wipe sample. The results of these wipe samples are used to confirm if the risk model assumptions for removable fraction are correct or conservative. If not, release limits may be incorrect and should be evaluated accordingly.

One consideration we also have done is use the counting instruments critical level to decide on wipes to send to a lab or to count longer. Another total count time reduction approach. Every sample is counted but only samples with counts distinguishable from background are counted longer (to meet MDC DQO).

Finally, a MARSSIM scenario B approach could be considered. Given some background levels of NORM isotopes may be present in dusts. This would be more involved.

Hope this helps:
Dave Hays

PS: With all of this said, the BPRG is very low as a result of the conservatism in the generic BPRG model used. As we have discussed, even a small change to site specific assumptions and source removal rate would increase the BPRG. The Navy seems to still be stuck on just saying the number is too low rather than trying to solve the issue.

From: Praskins, Wayne <Praskins.Wayne@epa.gov>
Sent: Thursday, February 11, 2021 7:47 PM
To: Hays, David C Jr CIV USARMY CENWK (USA) <David.C.Hays@usace.army.mil>; Kappelman, David <Kappelman.David@epa.gov>
Subject: [Non-DoD Source] HPNS RGs and MDCs

Dave and Dave –

We continue our discussion with the Navy about remediation goals for the removable fraction of any remaining radiological contamination at HPNS buildings. This afternoon we received responses to two questions about MDCs, with the Navy continuing to argue that it's impractical to measure the 1.2 dpm/100cm2 Ra-226 BPRG. I'd be interested in hearing your take on the accuracy and reasonableness of their responses. Thanks.

QUESTION #1. What are the detection limits of swipe analyzing instruments?

NAVY RESPONSE: The Parcel G Retesting Work Plan uses the Ludlum Model 3030 as a swipe counter, the same instrument that was used by CDPH at Parcel A. Count times required for various alpha MDCs using the Ludlum Model 3030P are as follows:

An MDC of 17.3 DPM/100 cm^2 requires a 1 min sample and background count time
An MDC of 3.5 DPM/100 cm^2 requires a 10 min sample and background count time
An MDC of 1.2 DPM/100 cm^2 requires a 60 min sample and background count time

Assumptions made are from the Ludlum specifications[1] as follows: background count rate of 0.3 CPM and instrument efficiency of 32% (Ra-226)

The required sample and background count times exponentially increase the lower the required MDC.

There are an estimated total of 5,500 swipes required for the Parcel G buildings, and an estimated total of 23,000 swipes required for all of the buildings at Hunters Point. Assuming a 40 hour work week for swipe processing, factoring in collection of 1 background sample for every 24 hours, would **require nearly 13 years to complete** at the 60 minute count time.

This is technically impractical, purely from the equipment detection limitations.

When measuring levels so close to zero, there will inherently be false positives caused by factors not attributable to Ra-226 contamination including: NORM in dust, instrument background fluctuations, low counting statistics, and/or equipment uncertainties. Demonstrating compliance with the proposed Ra-226 removable contamination limit of 1.2 DPM/100 cm^2 would result in an unacceptably high percentage of false positives. Statistically our goal is to achieve a 95% confidence level, which from a data standpoint, means we have confidence that the same sample would be replicated plus or minus 2 sigma from the measurement point. Contractor data from other projects at Hunters Point supports this position.
Additional MDC information may be found on *NUREG-1507 Minimum Detectable Concentrations with Typical Radiation Survey for Instruments for Various Contaminants and Field Conditions*[2]

QUESTION #2. CDPH used a 10-minute count time in their 2019 Parcel A dust sampling and achieved an MDA of 1.6 to 2.3 dpm/100cm2 with the following inputs/assumptions:

-Background Count of 30 minutes
-Background count rate of 0.26 CPM
-Sample Count Time of 10 minutes
-Instrument efficiency of 39%

NAVY RESPONSE. Using CDPH's assumptions, an MDC of 1.2 DPM/100cm^2 would be obtained using 35 minute sample and background count times. Even with an assumed increased instrument efficiency as high as CDPH's, the EPA proposed alpha removable fraction release criteria is still technically impracticable.

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